REPORT UPON GROUND WATER CONDITIONS
OF THE
SANTA CLARA VALLEY WATER CONSERVATION DISTRICT

March 9, 1965

J. Robert Roll

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J. Robert Roll
Chief Engineer

HERMANN J. GERDTS
President
EDMUND A. MIRASSOU
Vice-President
GLENN F. DODSON
Executive Administrator

VIOLET V. ENANDER
District Secretary
ALBERT T. HENLEY
Attorney
J. ROBERT ROLL
Chief Engineer

SANTA CLARA VALLEY WATER CONSERVATION DISTRICT

15420 ALMADEN ROAD • SAN JOSE 24, CALIFORNIA • TELEPHONE ANDREWS 9-3650

FILE NO.__________

Honorable Board of Directors
Santa Clara Valley Water Conservation District
15420 Almaden Road
San Jose 18, California

Gentlemen:

In accordance with Section 19.10 of the Water Conservation Act of 1931, there is presented herewith a Report Upon Ground Water Conditions Within The District.

Respectfully submitted,

J Robert Roll

J. Robert Roll
Chief Engineer

gld

DIRECTORS • ROBERT T. SAPP DIV. 2 • F. A. WILCOX DIV. 4 • E. A. MIRASSOU DIV. 6

INTRODUCTION

Section 19.10 et seq. of the Water Conservation Act of 1931 requires that an engineering report be prepared annually on the ground water conditions of the District. This report shall contain certain specified information needed by the Board of Directors of the District in making the determinations required of them by Section 19.11 of said Act.

In accordance with Resolution No. 742 of the Board of Directors of this District which indicated the Board's intention to divide the District into two zones, this report provides the required engineering data for the two areas outlined in said Resolution.

HYDROLOGIC DATA AVAILABLE

Since the last Report On Ground Water Conditions was presented on March 10, 1964, the District has completed the compilation and publication of its hydrologic records for the seasons 1935-36 through 1960-61.

Appendices containing additional years of records will be prepared each two years.

This storehouse of information is of great value to engineers in private practice and in public works in designing many types of structures and facilities.

RAINFALL AND RUNOFF

Although the 1962-63 rainfall season was one of the wettest on record, the 1963-64 season was only about two-thirds of normal. Due to the fact that most of the rain during this latter season came early, irrigation started earlier than usual.

The beginning of the 1964-65 rainfall season has been very good, so that most reservoirs filled early in the year.

GROUND WATER LEVELS

Plate I shows the average depth to water at the end of the irrigation season for each year since 1909. The end of the irrigation season coincides with the low point in the annual fluctuation of the ground water basin. This is the most critical time in the ground water cycle, as it is the period of highest pumping costs and greatest subsidence.

It will be noted that the average depth to water in the entire District at the low point of the season in 1964 was 147.2 feet which is 16.1 feet lower than for the corresponding point in the previous year. This is the result of the lower rainfall with its consequent decrease in recharge and higher pumping draft.

Plate II shows the fluctuation in depth to water in the seven geographical areas into which the District is divided for hydrological studies.

It should be noted that the greatest drop in water levels occurred in the Main (or Central portion) and the former artesian areas of the District which constitutes the major municipal pumping area. The least drop was in the Morgan Hill, Berryessa, and Evergreen-Mt. Pleasant areas of the District.

Plates III and IV are ground water contour maps for March 1964 and March 1942 respectively. These contours are based on water level elevations in wells tapping the principal aquifers in the area. It is recognized that there are minor aquifers in many areas with water levels different than those used in preparing these Plates.

By comparing these two contour maps, the effects of two factors that have influenced the water conditions in the valley over the years become apparent. In addition to a general, District-wide recession of ground water levels, severe overdraft has occurred in localized areas of concentrated municipal withdrawal.

It will be noted that in 1942 the water surface contours had a gradual and fairly uniform slope from the South to the North. The elevations varied from about 320 feet above sea level in the vicinity of Morgan Hill to about 20 feet above sea level near the bay.

By contrast, the ground water contours in March, 1964, are far from uniform. The elevation of the contours in the vicinity of Morgan Hill is only slightly lower than in 1942 but near the bay the water level had dropped to about 80 feet below sea level. In addition to this general drop, it will be noted that there are a number of areas in the valley in which the water level is as much as 120 feet below sea level. These "holes" or cones of depression are located at the sites of municipal and industrial pumping stations.

It is anticipated that when imported water becomes available in sufficient amounts, the present overdraft on the ground water basin can be reversed so that eventually the ground water table can be restored to its 1942 level.

RESERVOIR STORAGE AND RELEASES

Due to the fact that the 1963-64 season was deficient in rainfall and run-off, the water salvaged by the District's eight reservoirs was minimal. Out of a total storage capacity of 156,900 acre-feet, the maximum storage during the past season was only 35,225 acre-feet. Most of this was carryover storage from the previous season. Actually, only 12,000 acre-feet of new storage was accumulated this season.

EVAPORATION

During the 1963-64 season the evaporation as measured at the District's three evaporation stations varied from a low of 38.12 inches at Coyote Reservoir to a high of 48.03 inches at Alamitos Percolation Pond.

The total evaporation loss in the District's reservoirs during the 1963-64 season was 1,635 acre-feet.

WATER QUALITY

Two aspects of ground water quality were investigated by the District during 1964 - salt water intrusion near San Francisco Bay and the determination of certain chemical characteristics of ground water from wells located throughout the northern portion of Santa Clara Valley Water Conservation District.

The area of salt water intrusion is being studied by periodic analyses of ground water for chloride content from 30 wells near San Francisco Bay.

During the past year two significant changes were noted in the salt water intrusion situation. The chloride content of a contaminated well near Alviso decreased from 860 to 540 parts per million, following the successful sealing of a nearby faulty well.

A gravel packed well near Stevens Creek and Moffett Field was sampled in June, 1964, and the chloride content was 940 parts per million which was an increase of over 600 parts per million in one year. This contaminated well is within 2 miles of a gravel packed municipal supply well where the static water level is over 100 feet below sea level. Follow up studies are being made to determine how this problem can be corrected.

The study of certain chemical characteristics of ground water throughout the District is being made to determine the background quality of ground water before the percolation with imported water is begun. This is necessary to determine changes in ground water quality, if any, caused by recharging with imported water. This investigation is being made in cooperation with the State of California Department of Water Resources. Forty-two wells are sampled annually by District personnel and the analyses are made by the State.

PERCOLATION POND DEVELOPMENT

During the past year, work has continued on development of new percolation areas authorized by the 1957 bond election.

At Penitencia Creek, where the first imported water will be delivered in late April of this year, the new ponds are practically completed. Final work is underway so that everything will be ready in time to receive this water.

On the Los Gatos Creek all percolation ponds have been completed, and are ready to receive imported water this year.

Some of the off-stream ponds served from Los Gatos Creek are completed, namely, the Page, Oka Lane, and McGlincey Ponds. Others remain to be constructed. These are the Sunnyoaks, Budd, and Hollis Ponds.

On the Guadalupe River and its tributaries the Los Capitancillos, Alamitos, and Kooser Percolation Ponds are completed. The Guadalupe Percolation Ponds are under development and will be completed by 1972.

Some work was done on the Ford Road ponds on the Coyote Creek. These ponds are only about 7% completed. Since these will be the last ponds to receive imported water, work has been concentrated on those that will be needed first.

In order to locate any additional percolation areas and to assist in the design of areas already acquired the District, during the past year, embarked upon a program of geological prospecting throughout the valley.

GEOLOGICAL EXPLORATION BY RESISTIVITY METHODS

Last year the District constructed its own set of resistivity equipment. The use of this equipment is a relatively simple, quick method of getting complete data on depth, width, and composition of sub-soil layers. It has proven its worth in search for additional percolation areas and in increasing knowledge of the geology of existing percolation areas. There were six areas where this equipment has been used.

Stevens Creek Area:

Approximately 100 acres of potential percolation land were located east of Stevens Creek, between Homestead and McClellan Roads. Five areas were pinpointed in Stevens Creek channel where spreading dams would increase the percolation rates. From this basic information a study is under way to import additional water to this area for percolation and thereby relieve the over pumped area of Sunnyvale-Mountain View-Cupertino. (See Plate III)

Penitencia Area:

Nearly 100 acres of land were explored for the following purposes:

1.- To locate additional percolation sites to be acquired by the County of Santa Clara at its request to replace the percolation ability lost if the County concrete-lines Penitencia Creek. This phase is incomplete, although some potential areas have been located.

2.- To determine what gravel stratas could be intersected when the existing percolation ponds are deepened from Piedmont Avenue westward.

3.- To determine if any gravel areas would be encountered when a conduit is constructed from the end of our Penitencia Ponds to Penitencia Creek following the proposed Capitol Freeway. One such area was located.

San Tomas Area:

Some 15 acres of land adjacent to San Tomas Creek, from Latimer Avenue to Williams Road, were explored for the purpose of determining the type of design to be used for concrete-lining San Tomas Creek in order to assure that the percolation ability is not lost. Since this is a County project in conjunction with construction of San Tomas Expressway, the County will perform the special construction in these potential areas.

Rincon Avenue Area:

Approximately 20 acres of land were explored in and around the site of the proposed Campbell City Park on Rincon Avenue. In addition to exploration by resistivity methods, field permeability tests were made with favorable results. It was found that a joint development of a percolation-recreation pond in the city park would be feasible.

Budd-Hollis Avenue Area:

Exploration was made on approximately 20 acres of land located east of the proposed Budd Avenue Percolation Ponds for the purpose of replacing some 1.3 acres acquired by the County of Santa Clara for the San Tomas Expressway. Field permeability tests verified a suitable area for a percolation pond. The land pinpointed for the proposed Hollis Avenue Percolation Ponds is now under negotiation for purchase by the District.

Coyote Creek Area:

In an area in the vicinity of Coyote Creek between Singleton and Story Roads it was noted from study of well logs there appeared to be a dry gravel strata varying in thickness from 20 to 80 feet. According to the logs, this strata exists beneath Coyote Creek and, due to its proximity, water could be recharged from the creek. Resistivity tests verified this potential. The next step will be to prepare a plan for this project.

PUMPING DRAFT

When legislation authorizing the levying of a pump tax in lieu of an ad valorem tax on land was passed in 1963, it was hoped that meters would have been installed on most wells by the beginning of the 1964-65 fiscal year. Unfortunately, this has not been done.

This District entered into an agreement with the Santa Clara County Flood Control and Water District which provides that this District will collect Flood Control's tax on water diverted for direct irrigation use and Flood Control will collect this District's tax on water pumped from wells.

The reports on water use for the first six-month period of the 1964-65 fiscal year were due and the tax payable on January 31, 1965. The pumping draft reported for this period was far below expectations.

The Flood Control District reports that as of February 19, 1965, the amount of agricultural water reported as having been pumped within the Santa Clara Valley Water Conservation District for this first six-month period was 16,755 acre-feet. The amount of municipal and industrial water reported for this period was 69,476 acre-feet.

Records computed by this District since 1935 of the agricultural pumping draft based upon P.G.&E. agricultural power sales indicate that 63% of the entire seasonal draft takes place during the months July through December. On this basis the total agricultural pumping draft for the 1964-65 water year will be about 26,600 acre-feet.

The agricultural pumping draft computed by using agricultural power sales for each year since 1935 are listed in Table I. From these records it seems that the agricultural pumping draft should be around 70,000 acre-feet per year.

A study of water use by municipalities indicates that the municipal and industrial use during the first six-month period of the fiscal year is about 55.5% of the annual total. On this basis the reported use for the six-month period, July through December 1964, indicates an annual total of about 125,200 acre-feet.

SUBSIDENCE

During the past year a study of the effects of subsidence upon wells and drainage facilities was made.(1) This indicated that damage to drainage facilities has amounted to many millions of dollars and that well owners have suffered damages amounting to as much as $5 million.

The only permanent solution to these two problems is to build the underground water table up to the level at which it was between 1940 and 1946.

OVERDRAFT

In the chapter on Ground Water Levels it was pointed out that the average depth to water at the end of the irrigation season in 1964 was 16.1 feet lower than at the corresponding time in 1963. This represents a withdrawal from ground water storage of 96,600 acre-feet more than the replenishment.

INFORMATION REQUIRED BY ACT

Section 19.11 of the Water Conservation Act of 1931 requires the Board of Directors to make certain determinations prior to levying a ground water charge.

The data necessary in order to make the required determinations for the Zone North of Metcalf Road is presented on Table II. The corresponding data for the area South of Metcalf Road is presented on Table III.

In Table II, items 1, 3, and 4 need explanation. The average annual overdraft is given in item 1 as 20,000 acre-feet per year. Of this amount 6,000 acre-feet per year is an actual overdraft resulting in a lowering of the water table. The balance of 14,000 acre-feet per year is water of compaction. As was explained earlier, this is strictly not an overdraft item as it cannot be replaced, but it is indicated as such because it is desirable to stop this withdrawal. The same explanation applies to items 3 and 4.

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(1) Subsidence And Its Effect On Well Fields, by J. Robert Roll. Presented at AWWA California Section Meeting at San Diego on October 28, 1964.

The amount shown in item 9 in Table II is the minimum amount of water that must be added to the underground basin to supply the total pumping draft for the ensuing water year. This does not provide any water for alleviating the accumulated overdraft.

RECOMMENDATIONS

In conformity with Resolution No. 742 of the Board of Directors of the Santa Clara Valley Water Conservation District, it is recommended that the Board establish a zone within which to levy a ground water extraction charge.

This zone shall encompass all of the District except the following Santa Clara County Tax Code areas:

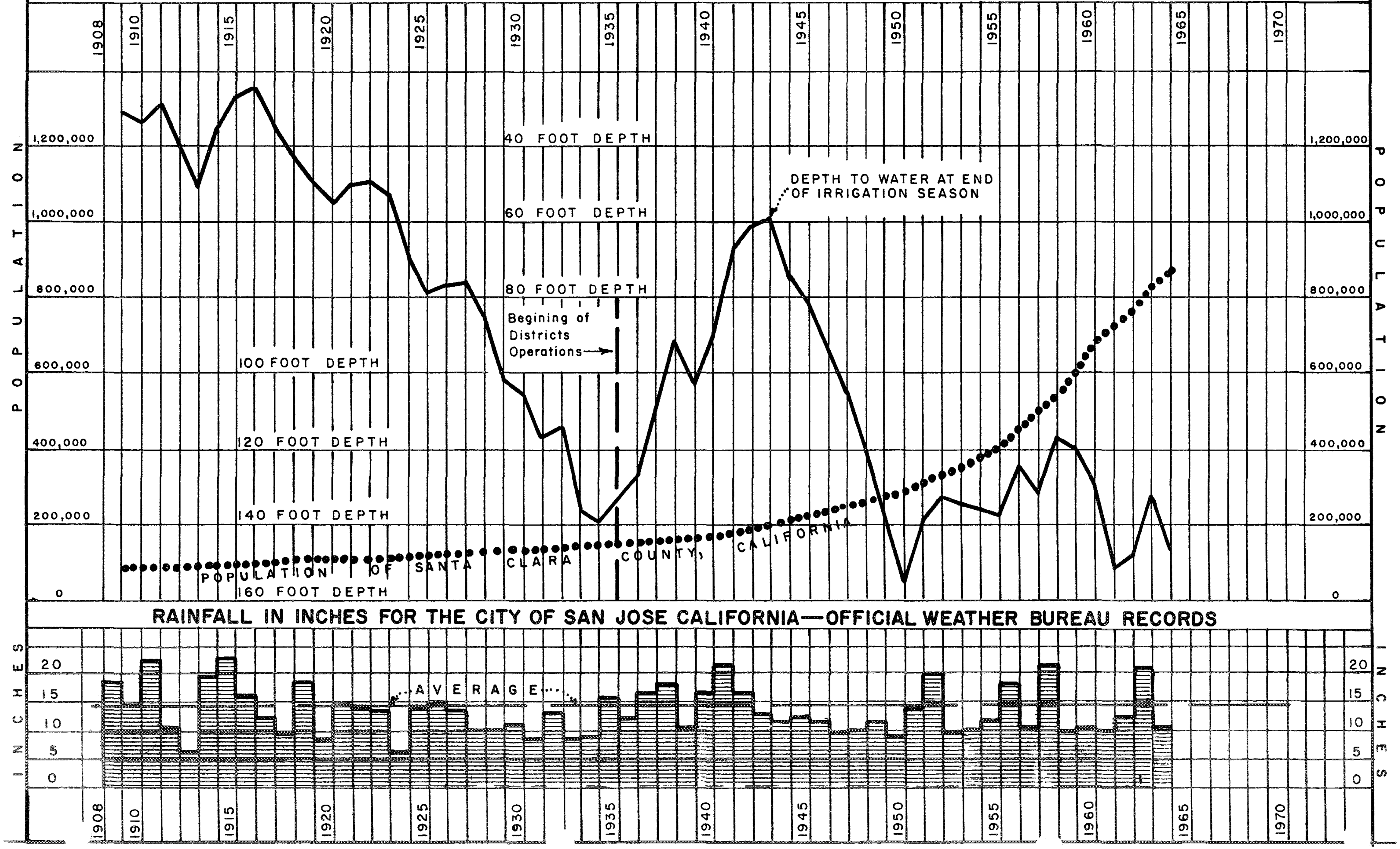
Tax Code Areas:
4-000
4-001
4-003
4-006
4-008
4-013
4-015
4-016
40-459
40-464
40-575
40-644
40-681
40-702
40-713
64-004
64-012
87-001
87-018
87-020
87-021
87-028
99-005

In general this is all of the land within that portion of the District lying northwesterly of Metcalf Road.

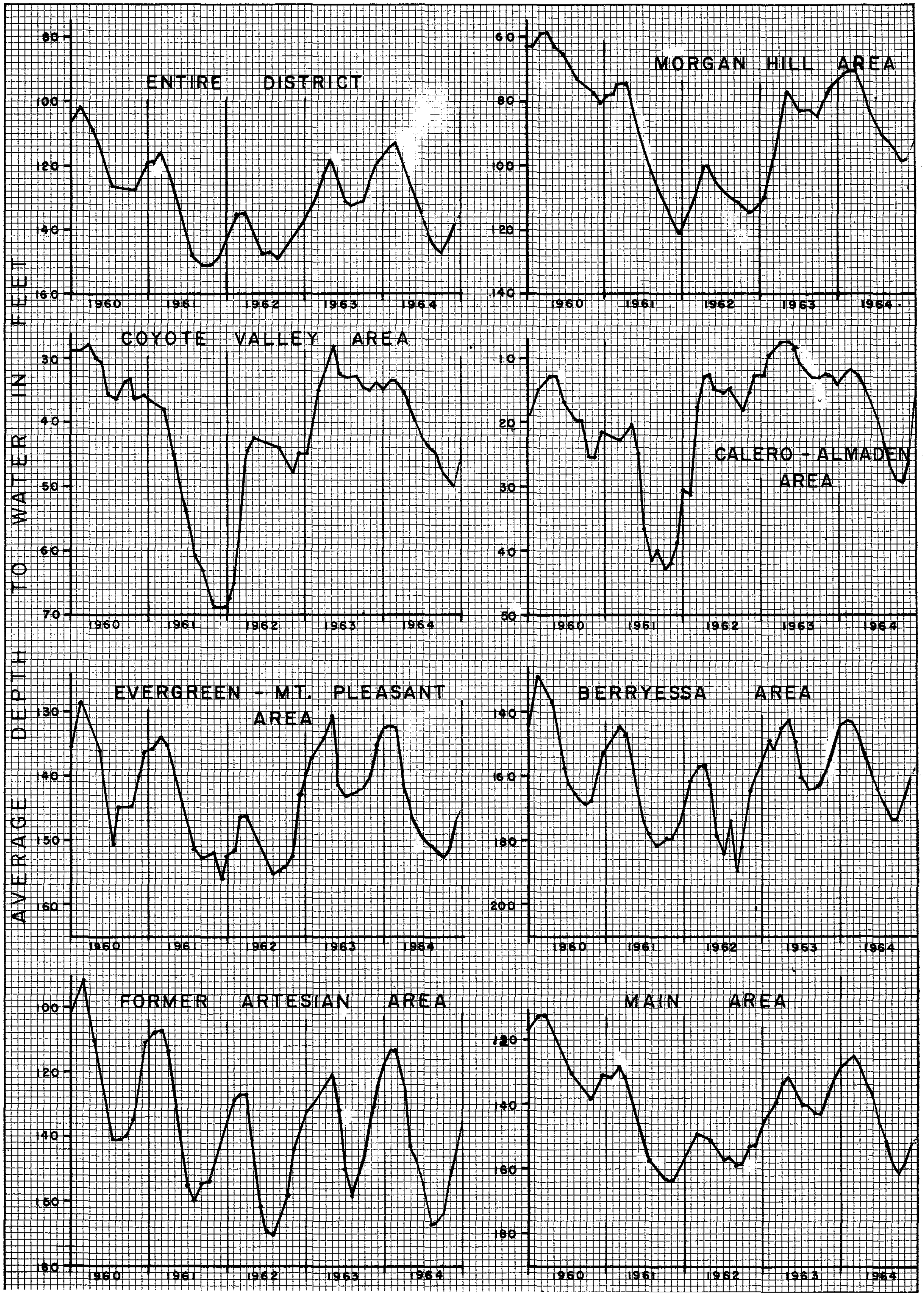
It is further recommended that the Board of Directors levy a pump tax in this zone based upon an estimated pumping draft of 30,000 acre-feet of agricultural water, 130,000 acre-feet of municipal and industrial water, and a surface delivery for agricultural purposes of 9,000 acre-feet.

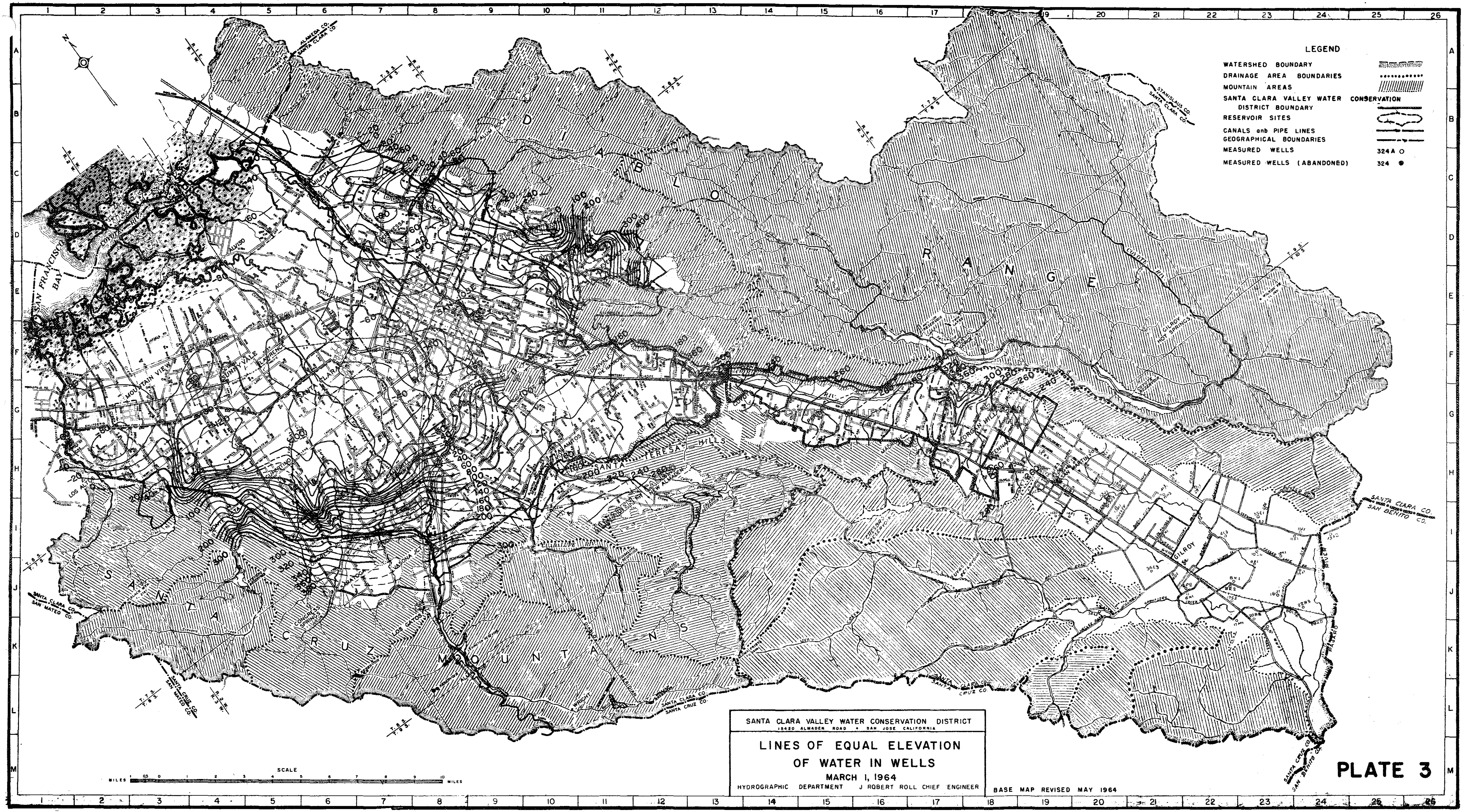
SANTA CLARA VALLEY WATER CONSERVATION DISTRICT

RAINFALL, AVERAGE DEPTH TO WATER AT END OF IRRIGATION SEASON, POPULATION



SANTA CLARA VALLEY WATER CONSERVATION DISTRICT
FLUCTUATION OF AVERAGE WATER LEVEL





SANTA CLARA VALLEY WATER CONSERVATION DISTRICT
15420 ALMADEN ROAD • SAN JOSE CALIFORNIA

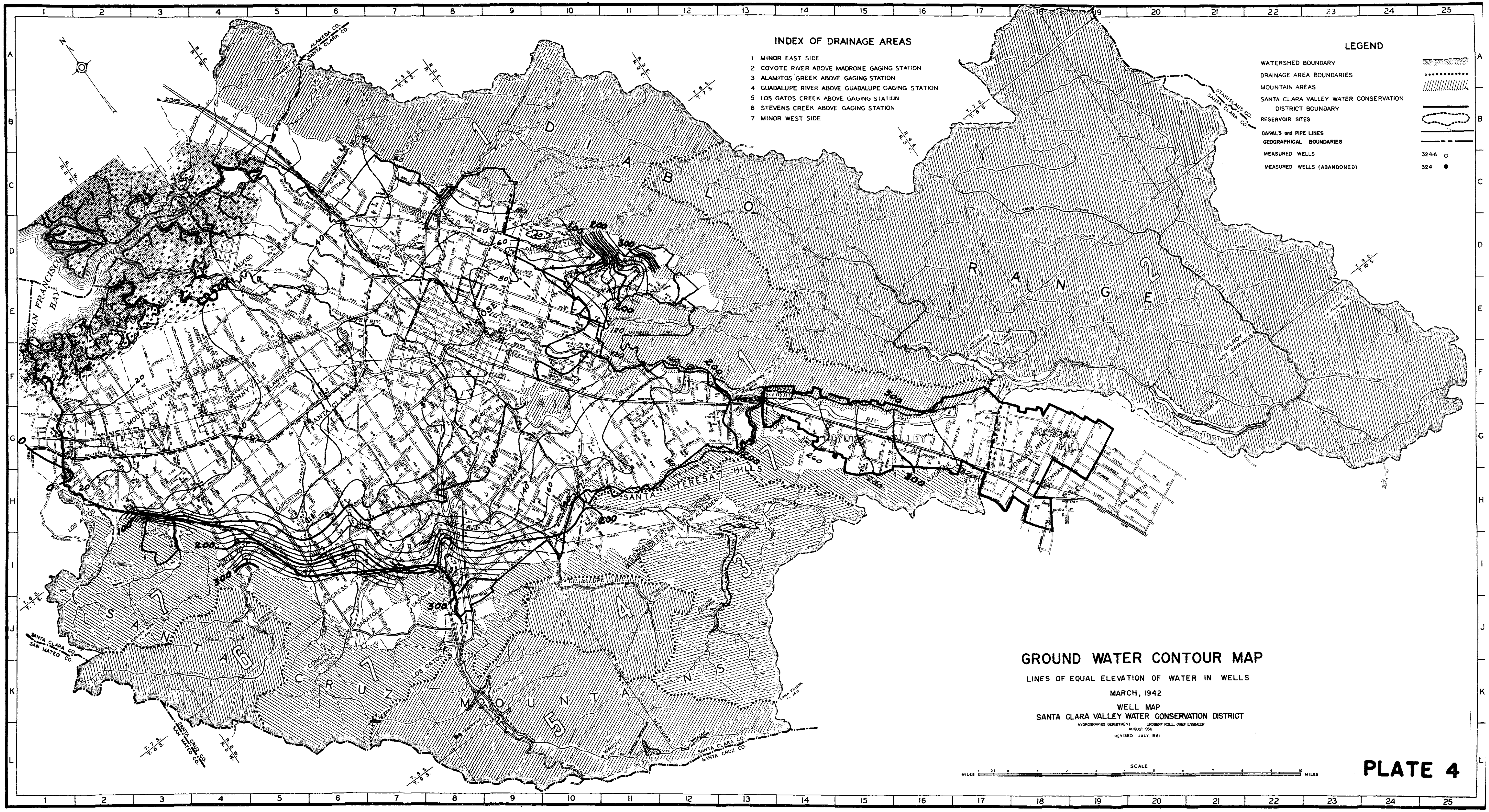
LINES OF EQUAL ELEVATION OF WATER IN WELLS

MARCH 1, 1964

HYDROGRAPHIC DEPARTMENT J ROBERT ROLL CHIEF ENGINEER

BASE MAP REVISED MAY 1964

PLATE 3



GROUND WATER CONTOUR MAP

LINES OF EQUAL ELEVATION OF WATER IN WELLS

MARCH, 1942

WELL MAP
SANTA CLARA VALLEY WATER CONSERVATION DISTRICT
HYDROGRAPHIC DEPARTMENT J.ROBERT ROLL, CHIEF ENGINEER
AUGUST 1956
REVISED JULY, 1961

PLATE 4

TABLE I

AGRICULTURAL PUMPING DRAFT COMPUTED FROM AGRICULTURAL POWER SALES

Year	Agricultural Pumping Draft Period Jan.-June	Agricultural Pumping Draft Period Jul.-Dec.	Total	Annual Rainfall Totals (inches) Annual Avg.=14.09
1935-36	30,110	37,980	68,090	12.41
36-37	22,130	41,590	63,720	16.93
37-38	21,660	39,740	61,400	18.57
38-39	38,060	39,540	77,600	10.67
1939-40	28,600	44,420	73,020	16.45
40-41	21,760	50,870	72,630	21.30
41-42	19,590	64,450	84,040	16.50
42-43	26,440	71,200	97,640	13.20
43-44	50,380	67,550	117,930	11.47
1944-45	35,570	60,540	96,110	12.43
45-46	38,200	62,610	100,810	11.23
46-47	39,340	65,600	104,940	9.04
47-48	49,380	64,750	114,130	9.89
48-49	34,000	64,180	98,180	11.48
1949-50	37,983	57,880	95,863	8.31
50-51	32,393	51,650	84,043	14.01
51-52	25,500	55,590	81,090	19.75
52-53	39,730	55,990	95,720	9.62
53-54	34,260	58,230	92,490	10.08
1954-55	51,570	70,200	121,770	11.85
55-56	30,020	60,190	90,210	18.09
56-57	33,530	60,770	94,300	10.04
57-58	21,190	57,360	78,550	21.91
58-59	41,960	60,620	102,580	9.78
1959-60	35,780	54,240	90,020	10.41
60-61	33,300	51,480	84,780	9.89
61-62	17,380	46,060	63,440	12.62
62-63	14,540	39,890	54,430	20.24
63-64	33,550	42,770	76,320	10.44
64-65		(36,880)		
Avg. % of total	37%	63%	100%	

TABLE II

AREA NORTH OF METCALF ROAD

1.	Average annual overdraft for the immediate past 10 water years		20,000 a.f./yr.
2.	Accumulated overdraft as of the last day of the preceding water year		522,000 a.f.
3.	Estimated annual overdraft for the current water year		-34,000 a.f.
4.	Estimated annual overdraft for the ensuing water year		- 4,000 a.f.
5.	Estimated accumulated overdraft as of the last day of the current water year		474,000 a.f.
6.	Estimated amount of agricultural water to be withdrawn from the ground water supplies of the District for the ensuing water year	*	30,000 a.f.
7.	Estimated amount of water other than agricultural water to be withdrawn from the ground water supplies of the District for the ensuing water year		130,000 a.f.
8.	Estimated amount of water needed for surface distribution for the ensuing water year		9,000 a.f.
9.	Amount of water that is necessary for the replenishment of the ground water supplies of the District for the ensuing water year	**	160,000 a.f.
10.	Amount of water the District is obligated to purchase during the ensuing water year		None a.f.
11.	Estimated total production of water from the ground water supplies of the District for the preceding water year		149,000 a.f.

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* Although the agricultural power sales records and land use studies both indicate that the agricultural pumping draft should be about 70,000 acre-feet per year, the pumping draft reports for the first half of the fiscal year 1964-65 indicate a much lower use. Inasmuch as the actual reported use will determine the tax received, this estimate is based on last season's reported use.

** This is the minimum amount required to provide for the estimated pumping draft during the ensuing water year.

TABLE III

AREA SOUTH OF METCALF ROAD

1.	Average annual overdraft for the immediate past 10 water years		- 1,400 a.f./yr.
2.	Accumulated overdraft as of the last day of the preceding water year		None a.f.
3.	Estimated annual overdraft for the current water year		None a.f.
4.	Estimated annual overdraft for the ensuing water year		None a.f.
5.	Estimated accumulated overdraft as of the last day of the current water year		None a.f.
6.	Estimated amount of agricultural water to be withdrawn from the ground water supplies of the District for the ensuing water year		16,000 a.f.
7.	Estimated amount of water other than agricultural water to be withdrawn from the ground water supplies of the District for the ensuing water year		1,600 a.f.
8.	Estimated amount of water needed for surface distribution for the ensuing water year		2,000 a.f.
9.	Amount of water that is necessary for the replenishment of the ground water supplies of the District for the ensuing water year	*	14,000 a.f.
10.	Amount of water the District is obligated to purchase during the ensuing water year		None a.f.
11.	Estimated total production of water from the ground water supplies of the District for the preceding water year		16,000 a.f.

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* This is the minimum amount required to provide for the estimated pumping draft during the ensuing water year.